

We Claim:

[00056] 1. A method for detecting when a fluid container has emptied during the course of an infusion, comprising:

sampling the pressure within an infusion line connecting a fluid container with an infusion flow control device at a selected frequency;

calculating a first averaged sampled pressure value by averaging the sampled pressure over a selected period of time;

storing the averaged sampled pressure value in a memory;

calculating a second averaged sampled pressure value by averaging the sampled pressure over a second selected period of time;

calculating a difference between the first averaged sampled pressure value and the second averaged sampled pressure value; and

providing a signal if the difference reaches a pre-determined threshold value.

2. The method of claim 1 further comprising:

continuing to sample the pressure within the infusion line and calculating averaged sampled pressure values, incrementing the selected period of time for each calculation;

comparing the latest averaged sample pressure value to a next previous averaged sampled pressure value and calculating a difference between the latest averaged sample pressure value and the next previous averaged sampled pressure value; and

providing a signal if the difference reaches a pre-determined threshold value.

3. The method of claim 2 further comprising:

processing multiple averaged sample pressure values to provide an optimized measure of a rate of change of a slope of the multiple averaged sample pressure values, and

determining when the optimized measure of the rate of change indicates the existence of a pre-defined condition within the infusion line.

4. The method of claim 1 wherein providing the signal provides an indication that the container is empty.

5. The method of claim 2 wherein providing the signal provides an indication that a drip chamber associated with the container is empty.

6. The method of claim 1 further comprising the step of synchronizing the sampling with movement of a pump mechanism that causes the fluid to flow from the fluid container.

7. The method of claim 1 wherein the step of sampling the fluid pressure comprises the step of sampling the pressure within an infusion line through direct contact with the infusion line at a location lying between a fluid movement mechanism in the fluid flow control device and the container.

8. The method of claim 1 further comprising the steps of sampling the pressure within an infusion line connecting a primary and a secondary fluid container with a fluid flow control device.

9. A system for determining when a fluid container connected to an infusion flow control device by an infusion line has been emptied of fluid, comprising:

- a pressure sensor in operable communication with the fluid line, the pressure sensor capable of monitoring a pressure within the fluid line and providing a signal representative of the monitored pressure; and

- a memory for storing pressure related values;

- a processor in operable communication with the pressure sensor and the memory, the processor programmed to receive signals from the pressure sensor and sample the received signals at selected intervals, the processor also programmed to calculate a first averaged sampled pressure value from the signals received during a first selected interval and store the first averaged sampled pressure value in the memory, the processor also programmed to compare the stored averaged sampled pressure value with a second averaged sampled pressure value calculated during a second selected interval and provide a signal if the comparison results in a difference between the first and second calculated averaged sampled pressure values reaches a predetermined threshold.

10. The system of claim 9 wherein the pressure sensor is located within a housing of the infusion flow control device.
11. The system of claim 9 wherein the processor is remote from the infusion flow control device.
12. The system of claim 9 wherein the processor is in communication with an information system of an institution, and wherein the signal is communicated to the information system for dissemination to at least one care giver within the institution.
13. The system of claim 9 wherein the processor is programmed to count the number of revolutions of a fluid movement mechanism of the infusion flow control device, and calculates the averaged pressure value when a predetermined number of revolutions have been completed.
14. The system of claim 9 wherein the pressure sensor is disposed in direct contact with the fluid line at a location between a fluid movement mechanism of the infusion flow control device and the container.
15. The system of claim 9 wherein the processor is configured to sample the received signals in synchronization with movement of a fluid control mechanism forming part of the infusion flow control device.
16. The system of claim 9 wherein the processor is further configured to sample the pressure within the infusion line that connects a primary and a secondary fluid container with the infusion flow control device.
17. The system of claim 9 wherein the infusion flow control device comprises an infusion pump.